

## Solid-state Laser

At right is a Titan-CW Ti:sapphire (titanium-doped sapphire) tunable laser, an innovation in solid-state laser technology jointly developed by the Research and Solid State Laser Divisions of Schwartz Electro-optics, Inc. (SEO), located in Concord, Massachusetts and Orlando, Florida, under NASA contract. The red area in the photo is the location of the titanium sapphire crystal, shown in closeup below. SEO is producing the laser for the commercial market, an outgrowth of a program sponsored by Langley Research Center to develop Ti:sapphire technology for space use.

Where dye lasers use dye solutions to emit light, the solid-state laser employs exotic crystals, in this case sapphires doped with titanium. Although solid state lasers generally have a limited range of wavelengths, the Ti:sapphire laser offers a broad wavelength range with an important bonus: it is relatively maintenance-free, thus an attractive candidate for long term space use. In satellite research, laser wavelengths are absorbed by chemical substances in the atmosphere; measurement of the amount of absorption provides data on chemical concentrations in the atmosphere for environmental studies.

The Langley Ti:sapphire program, which is generating other advances in solid-state laser technology, began in 1982 with basic research by Langley in concert with California's Stanford University and Christopher Newport College in Virginia. Later, Langley contracted with Union Carbide, Washougal, Washington for materials development, and with SEO and other companies for laser engineering.

SEO's Titan-CW series of Ti:sapphire tunable lasers have applicability in analytical equipment designed for qualitative analysis of carbohydrates and proteins, structural analysis of water, starch/sugar analyses, and measurements of salt in meat. Further applications are expected in semiconductor manufacture, in medicine for diagnosis and therapy, and in biochemistry.

